

the machine more manageable, and particularly enabling us at all times, and without trouble, to suit the power of the engine to its load of work, however variable and increasing; and brought into view a very interesting proposition in the mechanical theory of the engine, viz. that the whole performance of a given quantity of steam may be augmented by admitting it into the cylinder only during a part of the piston's motion. Mr Watt has varied the application of this proposition in many ways; and there is nothing about the machine which gives more employment to the sagacity and judgment of the engineer. The third improvement of the double impulse may be considered as the finishing touch given to the engine, and renders it as uniform in its action as any water-wheel. In the engine in its most perfect form there does not seem to be above one-fourth of the steam wasted; so that *it is not possible* to make it one-fourth part more powerful than it is at present.

70. The only thing that seems susceptible of considerable improvement is the great beam. The enormous strains exerted on its arms require a proportional strength. This requires a vast mass of matter, not less indeed in an engine with a cylinder of 54 inches than three tons and a half, moving with the velocity of three feet in a second, which must be communicated in about half a second. This mass must be brought into motion from a state of rest, must again be brought to rest, again into motion, and again to rest, to complete the period of a stroke. This consumes much power; and Mr Watt has not been able to load an engine with more than 10 or 11 pounds on the inch and preserve a sufficient quantity of motion, so as to make 12 or 15 8-foot strokes in a minute.*

* "There is no loss of power except the friction, as the power employed to give motion in the beginning of the stroke is returned in the latter part of it, by continuing the motion after the steam-regulating valve is shut." W.